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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/236,113	01/25/1999	XU SHI	1581.0250001	1912

7590 12/03/2001

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EXAMINER
CANTELMO, GREGG

ART UNIT	PAPER NUMBER
1753	15

DATE MAILED: 12/03/2001

Please find below and/or attached an Office communication concerning this application or proceeding.

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Office Action Summary	Application No.	Applicant(s)
	09/236,113	SHI ET AL.
	Examiner	Art Unit
	Gregg Cantelmo	1753

CF - 15

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *12 October 2001* .

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-25* is/are pending in the application.

4a) Of the above claim(s) *17-25* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-16* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☒ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *25 January 1999* is/are: a)☐ accepted or b)☒ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☒ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) ☐ The translation of the foreign language provisional application has been received.

15)☒ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) *11* .
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: .

DETAILED ACTION

Election/Restrictions

1. Claims 17-25 are withdrawn from further consideration pursuant to 37 CFR 1.142(b) as being drawn to a nonelected target and process of making a graphite target, there being no allowable generic or linking claim. Election was made **without** traverse in Paper No. 13.

Priority

2. Acknowledgment is made of applicant's claim for foreign priority based on an application filed in the United Kingdom on July 24, 1996. It is noted, however, that applicant has not filed a certified copy of the UK application as required by 35 U.S.C. 119(b).

3. Acknowledgment is made of applicant's claim for foreign priority based on an application filed under PCT as PCT/GB97/01992 on July 24, 1997. It is noted, however, that applicant has not filed a certified copy of the PCT application as required by 35 U.S.C. 119(b).

4. Applicant has not complied with one or more conditions for receiving the benefit of an earlier filing date under 35 U.S.C. 120 as follows:

An application in which the benefits of an earlier application are desired must contain a specific reference to the prior application(s) in the first sentence of the specification (37 CFR 1.78).

Information Disclosure Statement

5. The information disclosure statement filed January 25, 1999 has been placed in the application file and the information referred to therein has been considered as to the merits.

Drawings

6. This application has been filed with informal drawings which are acceptable for examination purposes only. Formal drawings will be required when the application is allowed.

7. The drawings are objected to because the content Figs. 8-11 do not appear to be clear. Correction is required.

8. The drawings are objected to under 37 CFR 1.83(a). The drawings must show every feature of the invention specified in the claims. Therefore, the means for generating a radial electric field (claim 9) must be shown or the feature(s) canceled from the claim(s). No new matter should be entered.

Specification

9. The title of the invention is not descriptive. A new title is required that is clearly indicative of the invention to which the claims are directed.

The following title is suggested: Cathode arc source with magnetic field generating means positioned above and below the cathode.

10. The disclosure is objected to because of the following informalities:

a. the application fails to provide sub-headings for the various sections of the patent application such as "Brief Description of the Drawings"' "Background Discussion", etc;

b. An application in which the benefits of an earlier application are desired must contain a specific reference to the prior application(s) in the first sentence of the specification (37 CFR 1.78).

Appropriate correction is required.

11. The following guidelines illustrate the preferred layout and content for patent applications. These guidelines are suggested for the applicant's use.

Arrangement of the Specification

The following order or arrangement is preferred in framing the specification and, except for the reference to "Microfiche Appendix" and the drawings, each of the lettered items should appear in upper case, without underlining or bold type, as section headings. If no text follows the section heading, the phrase "Not Applicable" should follow the section heading:

(a) Title of the Invention.
(b) Cross-References to Related Applications.
(c) Statement Regarding Federally Sponsored Research or Development.
(d) Reference to a "Microfiche Appendix" (see 37 CFR 1.96).
(e) Background of the Invention.
    1. Field of the Invention.
    2. Description of the Related Art including information disclosed under 37 CFR 1.97 and 1.98.
(f) Brief Summary of the Invention.
(g) Brief Description of the Several Views of the Drawing(s).
(h) Detailed Description of the Invention.
(i) Claim or Claims (commencing on a separate sheet).
(j) Abstract of the Disclosure (commencing on a separate sheet).
(k) Drawings.
(l) Sequence Listing (see 37 CFR 1.821-1.825).

Claim Objections

12. Claims 1-16 are objected to because of the following informalities: the claims are replete with minor grammatical errors. For example see claim 5, line 10 the term "field direction" would be better recited to include an appropriate article such as "the" to read as --the field direction-- (note antecedent basis for the field having a substantially normal direction is provided in claim 1, lines 7 and 8). See another example claim 7, line 2 wherein the phrase "field strength" should be --a field strength (assuming that the Examiner is correct in that there is no antecedent basis for a later field strength prior to this claim limitation). Applicant is advised to review all claims for similar grammatical issues. Appropriate correction is required.

Claim Rejections - 35 USC § 112

13. The following is a quotation of the first paragraph of 35 U.S.C. 112:

> **The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.**

14. Claim 14 is rejected under 35 U.S.C. 112, first paragraph, as containing subject matter which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention. The specification does not readily disclose how to steer the arc using the first magnetic field which according to claim 11 the first magnetic field is the field generated by the means disposed below the cathode surface. In actuality the speciation teaches that it is the coil located *above* the cathode that steers the plasma

(see page 6, ll. 6-11). Applicant is advised to change the word "first" in claim 14 to be --second-- as it stands the claims being read in light of the specification have been interpreted such that the field referred to in claim 14 is the field from the upper magnetic means (second magnetic field according to claim 11).

15. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

16. Claims are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

c. The relationship between the first and second magnetic fields as recited in claims 3 and 11-16 relative to the first and second magnetic field generating means is not explicitly clear. It is unclear if the means for generating the first and second magnetic fields are the same means for generating the first and second magnetic fields. Further due to the 112 first paragraph rejection above due to inconsistencies of the use of first and second fields relative to the first and second field generating means, it is not clear as to which field is generated by which means;

d.

Claim Rejections - 35 USC § 102

17. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

(e) the invention was described in a patent granted on an application for patent by another filed in the United States before the invention thereof by the applicant for patent, or on an international application by another who has fulfilled the requirements of paragraphs (1), (2), and (4) of section 371(c) of this title before the invention thereof by the applicant for patent.

18. Claims 1, 9, 10-11 and 13-16 are rejected under 35 U.S.C. 102(e) as being clearly anticipated by U.S. patent No. 6,103,074 (Khominich).

With respect to claim 1 Khominich discloses a cathode arc source comprising: a cathode 2, anode, vacuum chamber 4, magnetic means comprising one field generating means 7 disposed below the target and second field generating means 6 disposed above the cathode 2 (Fig. 2b as applied to claim 1). The magnetic and electric fields in the system of Fig. 2b serve to confine the positive ions in a beam towards the substrate (as applied to claim 9).

With respect to claim 10 Khominich discloses a cathode arc source comprising: a cathode 2, anode, vacuum chamber 4, cathode station for holding target of the cathode the target having front and rear surfaces, the magnetic field has a lateral field component effective to maintain the arc on the front surface of the target (Fig. 2b as applied to claim 10).

With respect to claim 11, Khominich discloses a generating a first magnetic field below the target and a second magnetic field generated above the target so as to generate a magnetic field that is resultant from the first and second fields and striking an arc in the resultant field (Fig. 2b as applied to claim 11). The power supplies are adjustable to vary the magnetic field and optimize arc striking (Fig. 2b as applied to claim 13). The upper magnetic field means steers the plasma towards substrate 5 (Fig.

2b as applied to claim 14). The magnetic fields are co-axial with the plasma emitted from the arc (Fig. 2b as applied to claims 15 and 16).

19. Claim 10 is rejected under 35 U.S.C. 102(b) as being anticipated by EP 0 495 447 A1 (EP '447).

EP '447 discloses a cathodic arc source comprising: cathode 17, anode/ process chamber 14, means 21 for generating a magnetic field within chamber 14, cathode station for location of a target 16 in electrical contact with cathode 17, the target having front and rear surfaces, the magnetic field generating means 21 generates a magnetic field at the front surface of the target having a lateral field component effective to maintain the arc on the front surface of the target during operation (see Figs. 3 and 4 as applied to claim 10).

20. Claim 10 is rejected under 35 U.S.C. 102(b) as being anticipated by Semenyuk et al. "Physical and Technological Features of the arc vacuum system for coatings deposition based on the plasma arc accelerator" (hereafter referred to as Semenyuk.

With respect to claim 10:

Semenyuk discloses a cathodic arc source comprising: cathode , anode/ process chamber 2, means 5 for generating a magnetic field within chamber 2, cathode station for location of a target 1 in electrical contact with cathode, the target having front and rear surfaces, the magnetic field generating means 5 generates a magnetic field at the front surface of the target having a lateral field component effective to maintain the arc on the front surface of the target during operation (see Fig. 1 as applied to claim 10).

Claim R jections - 35 USC § 103

21. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

22. Claims 2-8 and 12 are rejected under 35 U.S.C. 103(a) as being unpatentable over Khominich.

The teachings of Khominich with respect to claim 1 have been discussed above and are incorporated herein.

The difference between the instant claims and the preferred configurations of Khominich is of the anode being the chamber wall (claim 2) and striking the arc between the anodic chamber wall and cathode (claim 12).

The process vacuum chamber is often used as an anode or as a portion of the anode electrode assembly. The anode is sometimes positioned within the vacuum chamber, preferably along the magnetic force lines that are crossing the cathode surface to minimize the arc voltage and provide a certain stability of the arc discharge.

Thus Khominich recognized that it is well known in the art to use the vacuum chamber as an anode or portion of the anode assembly.

Khominich uses an alternative anode assembly as a preference since it The anode is insulated from the chamber to strengthen and sharpen the electric field potential created in the chamber. This stronger, sharper electric field potential is

contoured to create an electron trap having an aperture through which the plasma ions are directed at the substrate to be coated.

Yet it would have been obvious to one of ordinary skill in the art to configure the anode configuration in the manner known prior to the anode configuration of Khominich. Such configuration will capably provide an anode structure for striking an arc between the anode and cathode. Not using the particular configuration of Khominich will not render the apparatus non-functional but alter the strength and sharpness of the electric field potential.

Thus one of ordinary skill in the art would have readily recognized that the consequent loss of function of the particular anode of Khominich would occur, by using the chamber wall as the anode, yet still provide a cathode arc source that effectively operates.

Therefore it would have been obvious to one of ordinary skill in the art at the time the claimed invention was made to modify the teachings of

With respect to claims 3-8:

With respect to the particular field strengths of claims 3-8, such conditions are not held to be structural differences between the instant claimed apparatus and prior art apparatus. Note that Khominich uses adjustable power supplies to each coil. This teaches of a cathode arc source wherein any desired field strengths can be selected to create a desired field pattern. Thus the null or zero field point can be adjusted in any number of ways, readily apparent to one of ordinary skill in the art. Since claims 3-8 do

not structurally differentiate the instant apparatus and that of the prior art here, no patenable weight is accorded the desired fields strengths.

While intended use recitations and other types of functional language cannot be entirely disregarded. However, in apparatus, article, and composition claims, intended use must result in a structural difference between the claimed invention and the prior art in order to patentably distinguish the claimed invention from the prior art. If the prior art structure is capable of performing the intended use, then it meets the claim. In a claim drawn to a process of making, the intended use must result in a manipulative difference as compared to the prior art. In re Casey, 370 F.2d 576, 152 USPQ 235 (CCPA 1967); In re Otto, 312 F.2d 937, 938, 136 USPQ 458, 459 (CCPA 1963).

Claims directed to apparatus must be distinguished from the prior art in terms of structure rather than function. In re Danly, 263 F.2d 844, 847, 120 USPQ 528, 531 (CCPA 1959). See also MPEP § 2114.

The manner of operating the device does not differentiate an apparatus claim from the prior art. A claim containing a "recitation with respect to the manner in which a claimed apparatus is intended to be employed does not differentiate the claimed apparatus from a prior art apparatus" if the prior art apparatus teaches all the structural limitations of the claim. Ex parte Masham, 2 USPQ2d 1647 (Bd. Pat. App. & Inter. 1987).

23. Claim 14 is rejected under 35 U.S.C. 103(a) as being unpatentable over Khominich in view of U.S. patent No. 5,468,363 (Falabella '363).

The teachings of Khominich with respect to claim 11 have been discussed above and are incorporated herein

The difference between instant claims 14 and Khominich is that Khominich does not disclose using a macroparticle filter.

With respect to using a macroparticle filter:

Falabella '363 uses a macroparticle filter 11 prevents macroparticles from bouncing off the walls of the chamber and thus reaching the part to be coated.

The motivation for using a macroparticle filter is to filter the macroparticles out of the plasma thereby preventing macroparticle deposition onto the part to be coated.

Therefore it would have been obvious to one of ordinary skill in the art at the time the claimed invention was made to modify the teachings of Khominich by using a macroparticle filter as taught by Falabella '363 since it would have prevented macroparticle deposition onto the part to be coated.

24. Claims 1-9 and 11-16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Semenyuk in view of Falabella '363.

With respect to claim 1 Semenyuk discloses a cathode arc source comprising: cathode, anode/vacuum chamber 2, means for generating a magnetic field in the chamber having a direction normal to the front surface of the target and zero field strength positioned above the target within the chamber. The magnetic field is generated by a first field generating means 5 located above the target and second field generating means 4 located below the target (see Fig. 2b as applied to claim 1). The chamber is the anode (page 872, column 1, as applied to claim 2). The magnetic and

electric fields within the system of Fig. 1 serve to confine the positive ions in a beam towards the substrate (as applied to claim 9).

The difference between the instant claims and Semenyuk is that Semenyuk does not disclose using a graphite cathode source (claim 1):

With respect to claims 3-8:

With respect to the particular field strengths of claims 3-8, such conditions are not held to be structural differences between the instant claimed apparatus and prior art apparatus. Note that Khominich uses adjustable power supplies to each coil. This teaches of a cathode arc source wherein any desired field strengths can be selected to create a desired field pattern. Thus the null or zero field point can be adjusted in any number of ways, readily apparent to one of ordinary skill in the art. Since claims 3-8 do not structurally differentiate the instant apparatus and that of the prior art here, no patenable weight is accorded the desired fields strengths.

While intended use recitations and other types of functional language cannot be entirely disregarded. However, in apparatus, article, and composition claims, intended use must result in a structural difference between the claimed invention and the prior art in order to patentably distinguish the claimed invention from the prior art. If the prior art structure is capable of performing the intended use, then it meets the claim. In a claim drawn to a process of making, the intended use must result in a manipulative difference

as compared to the prior art. In re Casey, 370 F.2d 576, 152 USPQ 235 (CCPA 1967); In re Otto, 312 F.2d 937, 938, 136 USPQ 458, 459 (CCPA 1963).

Claims directed to apparatus must be distinguished from the prior art in terms of structure rather than function. In re Danly, 263 F.2d 844, 847, 120 USPQ 528, 531 (CCPA 1959). See also MPEP § 2114.

The manner of operating the device does not differentiate an apparatus claim from the prior art. A claim containing a "recitation with respect to the manner in which a claimed apparatus is intended to be employed does not differentiate the claimed apparatus from a prior art apparatus" if the prior art apparatus teaches all the structural limitations of the claim. Ex parte Masham, 2 USPQ2d 1647 (Bd. Pat. App. & Inter. 1987).

The arc system is used for various materials (page 872, column 1, ll. 1-10). Selection of the particular cathode material is dependent upon the desired film to be coated onto a substrate.

Use of graphite cathode sources in cathode arc deposition is well known in the art as taught by Falebella '363 (col. 3. ll. 55-60) or the admitted prior art relied upon in the instant application (page 2, ll. 7-15).

The motivation for selection of graphite as the cathode source is to deposit carbon films onto the substrate.

Therefore it would have been obvious to one of ordinary skill in the art at the time the claimed invention was made to modify the teachings of Semenyuk by selecting the cathode to be a particular material, in the case of the instant claims, of graphite, since

selection of a preferred material would have been an obvious design choice dependent upon the requisite coating to be applied to the substrate, graphite being a known source used as a cathode in cathodic arc sources. Selection of a known material on the basis of its suitability for the intended use has been held to be a matter of design choice. *In re Leshin* 125 USPQ 416.

With respect to claims 11-16:

Semenyuk discloses a method of striking an arc at a cathode target in a vacuum chamber comprising: generating a first magnetic field below the target 1 from magnetic means 4 and a second magnetic mean 5 having a second direction opposite to that of the first means 4 located above the target 1 (See Fig. 1) to generate a magnetic field that is resultant from the two fields where the arc is struck within the field (see Fig 2b and page 872, column 1, lines 1-3 as applied to claim 11). The arc is struck between the cathode and chamber wall anode 2 (Fig. 1 as applied to claim 12). Figs. 2 a and b show the magnetic field structure when only one coil is energized and when both coils are energized. This teaches of varying the resultant field by energizing both coils to optimize arc striking near the operating end of the cathode surface (as applied to claim 13). The fields are coaxial with the plasma emitted when the coils are energized as shown in Fig. 2b (as applied to claims 15 and 16). Semenyuk uses the upper magnetic field means to steer the plasma towards the substrate 31 (Fig. 8 as applied to claim 14) but is silent as to using a macroparticle filter.

The differences between the instant claims and Semenyuk are that Semenyuk does not disclose using a graphite source (claim 11) or using a macroparticle filter (claim 14).

With respect to claim 11:

The arc system is used for various materials (page 872, column 1, ll. 1-10). Selection of the particular cathode material is dependent upon the desired film to be coated onto a substrate.

Use of graphite cathode sources in cathode arc deposition is well known in the art as taught by Falebella '363 (col. 3. ll. 55-60) or the admitted prior art relied upon in the instant application (page 2, ll. 7-15).

The motivation for selection of graphite as the cathode source is to deposit carbon films onto the substrate.

Therefore it would have been obvious to one of ordinary skill in the art at the time the claimed invention was made to modify the teachings of Semenyuk by selecting the cathode to be a particular material, in the case of the instant claims, of graphite, since selection of a preferred material would have been an obvious design choice dependent upon the requisite coating to be applied to the substrate, graphite being a known source used as a cathode in cathodic arc sources. Selection of a known material on the basis of its suitability for the intended use has been held to be a matter of design choice. *In re Leshin* 125 USPQ 416.

With respect to using a macroparticle filter (claim 14):

Falabella '363 uses a macroparticle filter 11 prevents macroparticles from bouncing off the walls of the chamber and thus reaching the part to be coated.

The motivation for using a macroparticle filter is to filter the macroparticles out of the plasma thereby preventing macroparticle deposition onto the part to be coated.

Therefore it would have been obvious to one of ordinary skill in the art at the time the claimed invention was made to modify the teachings of Semenyuk by using a macroparticle filter as taught by Falabella '363 since it would have prevented macroparticle deposition onto the part to be coated.

Conclusion

25. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. EP 0 496 447 A1 discloses a system and method of controlling an arc spot in a vacuum arc vapor deposition source.

26. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Gregg Cantelmo whose telephone number is (703) 305-0635. The examiner can normally be reached on Monday through Thursday from 8:00 a.m. to 5:30 p.m. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nam Nguyen, can be reached on (703) 308-3322. FAX communications should be sent to the appropriate FAX number: (703) 872-9311 for After Final Responses only; (703) 872-9310 for all other responses. FAXES received after 4 p.m. will not be processed until the following business day. Any inquiry of a

general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0661.

gc

November 21, 2001

NAM NGUYEN
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 1700